the narda microwave corporation

118-160 HERRICKS RD. • MINEOLA, N. Y.

INSTRUCTION MANUAL FOR TUNED PREAMPLIFIER NARDA MODEL 442

2-19-59

INSTRUCTION MANUAL

FOR

TUNED PREAMPLIFIER

NARDA MODEL 442

February 19, 1959

INSTRUCTION MANUAL FOR TUNED PREAMPLIFIER

NARDA MODEL 442

FUNCTION DESCRIPTION

The NARDA Model 442 Preamplifier may be used for the measurement of attenuation, coupling, insertion loss, gain and other pertinent quantities which represent a measure of relative power. When used in conjunction with a vacuum tube volt meter having a decibel scale, these relative power measurements are rapid and direct. There is no need for the substitution of audio attenuators, and the amplifier gain may be fixed for power ratios up to 50 db. The high gain and excellent linearity permits the use of this amplifier over this extremely large dynamic range.

Provision is made for use with crystals, as well as high and low current bolometers. Waveguide or coaxial bolometer mounts may be used as detectors. A bolometer protection circuit permits switching and connect-disconnect in any sequence without danger of bolometer burn-out.

The Model 442 combines high gain, low noise and maximum versatility, in a small, compact transistorized package. The unit is battery-operated, which provides independence from line voltage deviations and fluctuations, and complete portability. Batteries are supplied with each tuned preamplifier. Replacements are readily available and easy to install.

SPECIFICATIONS Model 442

Maximum Gain:	20,000 Voltage Gain, Minimum
Noise:	Less than 0.7 mv output Eq .35μV in-put
Frequency:	1000 cps plus/minus 1% (plug-in frequency networks available for 315-3000 cps)
Bandwidth:	25-30 cps
Linearity:	± 0.1 db maximum to 75 v. output ± 0.2 db " " 100 v. "
Output:	Up to 100 v. across 0.5 Megohm VTVM Load (Ballantine VTVM)
Input Impedance:	200Ω
Detectors:	Microwave crystal or bolometer (4.5 or 8.75 ma bias)
Bolometer Bias:	4.3 ma or 8.4 ma (jack provided for measuring bolometer current)

NOTE: Protective circuit permits any switching operation or cable connections to be made or broken without danger to bolometer.

Power:	Mercury batteries, 400 hours operating life; 2 yrs shelf life. Batteries included with unit.
Size:	8" wide, 7" high, 7-1/2" deep
Weight:	9 lb.

CONTROLS AND CONNECTIONS

Coarse and Fine Gain:	50-20,000 gain range
Input:	Type BNC, 200 Ω
Output:	Parallel connected BNC and Superior binding posts
Bolometer Bias:	Jack (back panel)
Detector Switch:	Off, Crystal, low and high bolometer positions

OPERATION

To place the unit in operation turn the selector switch to CRYSTAL or to the appropriate position if the Preamplifier is to be used with a bolometer sensing element (low current bolometer 4.5 ma., or high current bolometer 8.75 ma.) The dual concentric gain control knobs can be used to adjust the gain of the unit, the coarse control being the outer and the fine control being the center knob. Adjusting either of these controls in a clockwise position will cause the gain to be increased. Connect the input to the detector, and the output to a VTVM having a DB scale.

NOTE 1

When using Model 442 in conjunction with a VTVM having a DB scale, and with a sensing element having square law characteristics for making attenuation measurements, it should be noted that the actual attenuation measured will be the DB indicated by the meter divided by 2.

NOTE 2

Caution should be observed when a crystal detector is used, since microwave crystals do not have accurate square law detection characteristics. The accuracy of measurements with this Preamplifier are dependent upon the nearness to square law of the detector.

NOTE 3

Bolometers are very accurately square law, and, if operated at r.f. power levels below 0.5 milliwatt, will cause an error not greater than 0.1 db.

EXTERNAL CONNECTIONS

OUTPUT JACKS

The output jacks on the lower right hand front panel permit connection of the output of the NARDA Tuned Preamplifier to an external indicating device. The dual Superior binding posts and the BNC connector are internally connected in parallel so that either may be used. To achieve optimum linearity and output signal, the impedance of the indicating device applied to the output jack should be 0.5 M Ω, such as in Ballantine Labs. Model 300 VTVM. Higher impedance should be shunted to obtain a 0.5 M Ω load.

CURRENT JACK

In the rear of the unit is provided a telephone type jack for the measurement of bolometer current. A low resistance (20 Ω max.) d.c. milliameter should be used for measurement of bolometer current.

THEORY OF OPERATION

Model 442 consists of a two-stage preamplifier with gain controls and a frequency selective network, together with a bolometer bias supply for external elements. Frequency selective networks are plug-in and interchangeable with the plug-in tuned circuits used in Narda Model 441 VSWR Amplifier.

Bolometer bias is provided by battery B1 and the network containing R1, R2, R3, C1 and CR2. Zener diode CR2 serves to regulate the bias current and to prevent a high charge from building up on C1 when no bolometer element is connected. Protection against bolometer burnout upon "connect" is thereby obtained. CR-1 is reversed bias when current is supplied to the external element, but it protects against high induced voltages across the transformer primary winding upon "disconnect". Complete protection against bolometer burnout is thereby provided.

Power for the Tuned Preamplifier is provided by four mercury batteries connected to operate as two separate supplies. Decoupling of stages is obtained in this manner.

CONSTRUCTION

Printed circuit and dip soldering techniques have been employed in the construction of the NARDA Tuned Preamplifier. The majority of the components have been mounted on a phenolic board which is supported on the upper side of the chassis. Frequency selective networks are supplied in sealed closures, and plug into an octal socket on the chassis. Batteries are contained in a special housing with positive contacts and provision for easy replacement of batteries by means of two knurled nuts. The battery housing, mounted on the chassis, and the frequency

selective network, are accessible from the rear of the unit. The hinged rear cover is held closed with a Dzus fastener.

Accessible from the bottom of the unit is a stand which may be withdrawn from within the case and swung either forward or backward. The instrument may thus be tilted backward or forward for greater ease in use.

MAINTENANCE

Normal maintenance on NARDA Model 442 Tuned Preamplifier consists only of replacement of batteries at intervals dependent upon usage. Each battery has an initial voltage of 6.7 volts. At the end of life the load voltage will be about 5.1 volts although the unit may perform somewhat beyond that point.

CAUTION

IF FOR ANY REASON THE BATTERY POLARITIES ARE REVERSED THE UNIT WILL BE DAMAGED. IN SUCH INSTANCES THE UNIT SHOULD BE RETURNED TO THE FACTORY FOR REPAIR.

Should it become necessary to remove the unit from the cabinet for servicing, this can be done by first removing the feet and then pushing the chassis and front panel assembly out the rear of the housing. The stand must be pushed up inside the unit before doing this because it is part of the chassis.

ACCESSORIES:

Additional plug-in tuned circuits with any center frequency from 115 to 3000 cps may be obtained.

A plug-in circuit for broadband operation reduces the sensitivity by a factor of 4X. Bandwidth is then 240 to 4000 cps.

BATTERY REQUIREMENTS

Reference Designation	Total per set	Manufacturer's Type Number	
		Mallory	Eveready
B1, B2, B3, B4	4	302642-M	E302642

ADDITIONAL EQUIPMENT

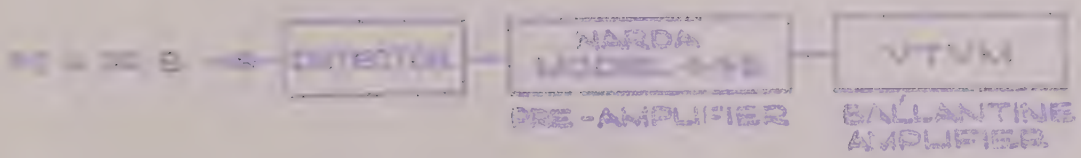
A complete line of NARDA waveguide and coaxial bolometer mounts may be used for attenuation measurements with the Preamplifier.

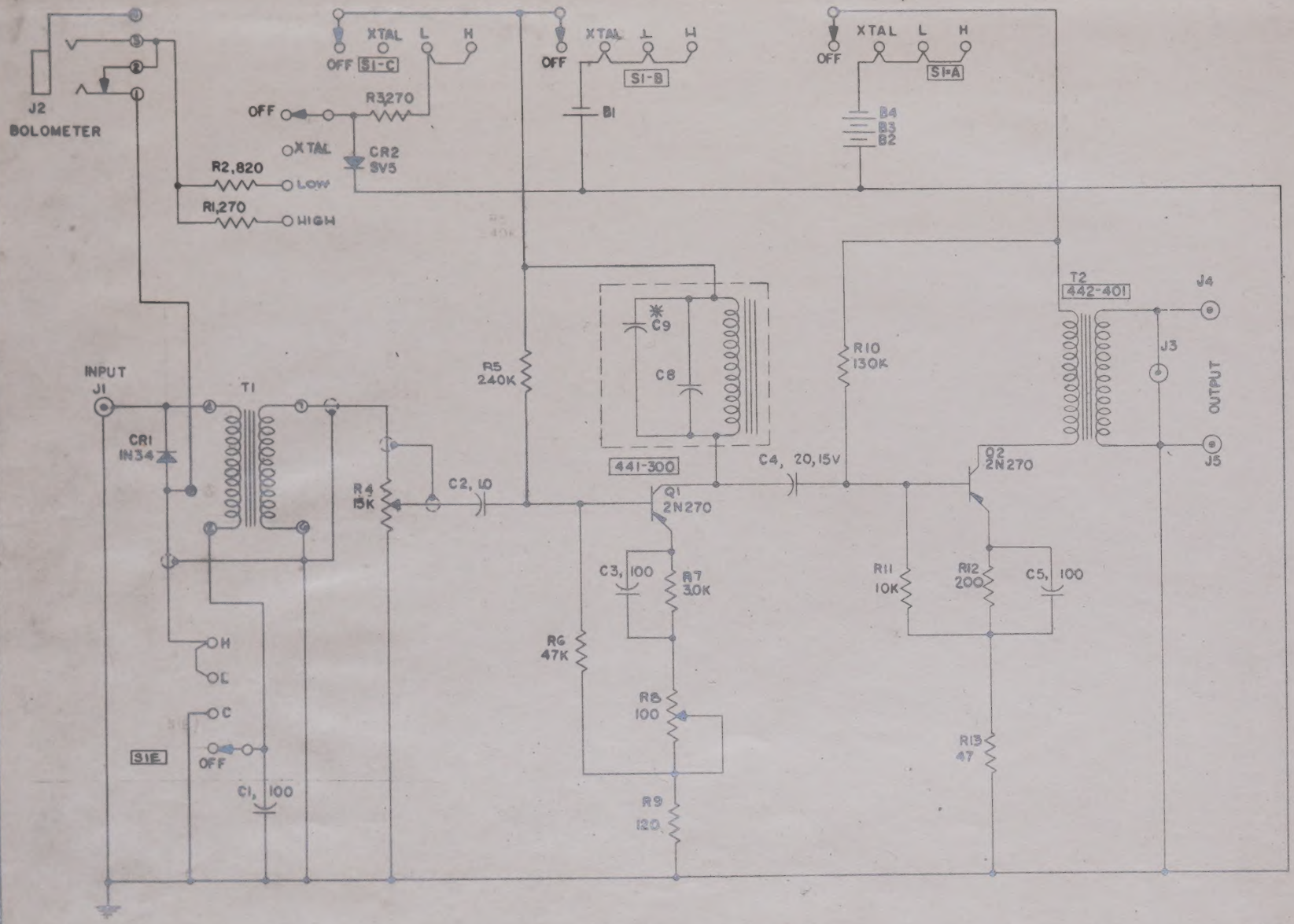
NARDA BOLOMETERS recommended for use with the Preamplifier:

(Any 200 Ω bolometer requiring 4.5 or 6.75 ma bias may be used)

N-605, N-610B, N-621B, N-603 (coaxial), N-004.

The following is a typical test set-up with which the Preamplifier can be used:



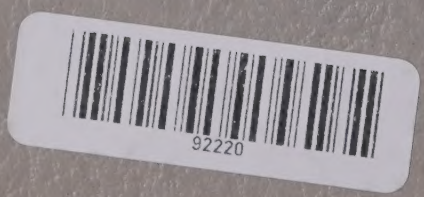


NOTES:
1-ALL RESISTORS IN OHMS
2-ALL CAPACITORS IN MICROFARADS @ 6V UNLESS OTHERWISE SPECIFIED
3-*SELECT ON TEST

DRAFTSMAN	N.D.	10-15-63	
DESIGN	JAT	10-28-63	SCHEMATIC
MATERIAL			TUNED PREAMPLIFIER
TREATMENT			
FINISH		12-4-63	SCALE

the narda microwave corporation
PLAINVIEW, NEW YORK

SIZE C | 442-203


92220